Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

$$\therefore r=\frac{abc\{ab+ac+bc\pm2\sqrt{abc(a+b+c)}\}}{4abc(a+b+c)-(ab+ac+bc)^2}=\frac{\{863\pm102\sqrt{95}\}4845}{243611};$$

$\therefore r=36.93595$ or -2.608803.

The first value is the radius of circumscribing circle, the second is the radius of the circle inscribed in the space enclosed by the three circles.

PROBLEMS.

50. **Proposed by B. F. FINKEL, A. M., Professor of Mathematics and Physics in Drury College, Springfield, Missouri.**

Draw a line perpendicular to the base of a triangle dividing the triangle in the ratio of m to n.

51. **Proposed by G. B. M. ZERR, A. M., Ph. D., Vice President and Professor of Mathematics in the Texarkana College, Texarkana, Arkansas.**

To construct a trapezoid; given the bases, the perpendicular distance between the bases and the angle formed by the diagonals.

◆

CALCULUS.

Conducted by J. M. COLAW, Monterey, Va. All contributions to this department should be sent to him

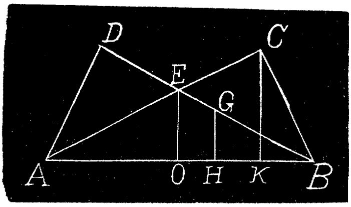
SOLUTIONS OF PROBLEMS.

36. **Proposed by H. C. WHITAKER, B. Sc., M. E., Professor of Mathematics, Manual Training School, Philadelphia, Pennsylvania.**

A cube is revolved on its diagonal as an axis. Define the figure described and calculate its volume.

Solution by G. B. M. ZERR, A. M., Ph. D., Vice President and Professor of Mathematics in the Texarkana College, Texarkana, Arkansas.

The surface of the solid is that generated by revolving $ADECB$ about AB as an axis.



Let $AD=BC=a$ be the side of the cube. Then $AC=BD=a\sqrt{2}$, $AB=a\sqrt{3}$, $OC=\frac{a\sqrt{3}}{2}$. $AC^2=AB.AK$. $\therefore AK=\frac{2a}{\sqrt{3}}$. $CK^2=AK.BK=AK(AB-AK)$.

$$\therefore CK=\frac{a\sqrt{2}}{\sqrt{3}}.$$

$$GH=\tfrac{1}{3}CK=\frac{a\sqrt{2}}{3\sqrt{3}}.\quad EO:AO=CK:AK.\quad \therefore EO=\frac{a\sqrt{6}}{4}.$$

$$\text{Area } ACB=\text{area } ADB=\tfrac{1}{2}AB.CK=\frac{a^2\sqrt{2}}{2}=A.$$

$$\text{Area } AEB=\tfrac{1}{2}AB.EO=\frac{3a^2\sqrt{2}}{8}=A'.$$

$$V=\text{required volume}=2(2\pi GH.A)-2\pi EO.\frac{A'}{3}.$$

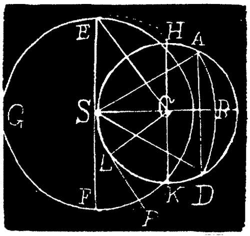
$$\therefore\ V=\frac{4a^3\pi}{3\sqrt{3}}-\frac{a^3\pi\sqrt{3}}{8}=\frac{23a^3\pi}{24\sqrt{3}}=\frac{23a^3\pi\sqrt{3}}{72}.$$

37. Proposed by J. A. CALDERHEAD, Superintendent of Schools, Limaville, Ohio.

A man ties two mules—one to the outside of a circular wall, the other to the inside. If the lengths of the ropes of each is one-fourth the circumference of the wall, and both together can graze over one acre of ground: find the circumference of the wall.

I. Solution by COOPER D. SCHMITT, Professor of Mathematics in the University of Tennessee, Knoxville, Tennessee.

Let S be the point where the mules are fastened. The mule grazing on the outside, grazes over the semi-circle $EGF+HSE$ and FSP. The mule on the inside grazes over the segment $SHA+$ segment $SKD+$ sector ASD.



We must find the area of these different portions and their sum equals one acre or 160 sq. rods.

1. To find the area of sector $ABDSA$. Since $AS=\frac{\pi r}{2}$, we have $\cos ASB=\frac{1}{4}\pi$. $\therefore$ $ASB=38^\circ\ 15'$, and area of sector $=\frac{76\frac{1}{2}}{360}.\pi.\frac{\pi^2r^2}{4}$.

2, To find area of segment SHA. $\angle SCA=103^\circ\ 30'$. Segment $SHA=$sector $SHAC-\triangle ASC$ $=\frac{103\frac{1}{2}}{360}\pi r^2-\frac{1}{2}r^2\sin 103\frac{1}{2}^\circ$. Segment $DSK=$segment SAH.

3. Area of $EGF=\frac{1}{2}\pi\left(\frac{\pi^2r^2}{4}\right)$.

4. Area of involute $ESHA=$area $CHE+$area $ECS-$area $\triangle SCH$ $=$(by the Calculus)$\frac{SC^3}{6r}+\frac{1}{2}SC.r-\frac{1}{4}\pi r^2$. But $SC=\frac{1}{2}\pi r$. $\therefore$ involute $ESHA=(\frac{1}{2}\pi r)^3\div 6r+\frac{1}{2}.\frac{1}{2}\pi r.r-\frac{1}{4}\pi r^2=\frac{1}{48}\pi^3r^2$.

The area of involute $FSLK=$area of involute $ESHA$.

Combining these different areas, we have

$$r^2\left[\frac{153}{720}\frac{\pi^3}{4}+\frac{207}{360}\pi-\sin 103\tfrac{1}{2}^\circ+\frac{\pi^3}{8}+\frac{n^3}{24}\right]=160.$$

$$r^2\left[\frac{51\pi^3}{960}+\frac{207}{360}\pi-.9724+\frac{\pi^3}{6}\right]=160,$$